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If your company is considering the Theory Of Constraints

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Abstract

TOC's basic vocabulary emphasizes its philosophy and its three performance measures. Throughput equals sales revenue minus direct materials cost--it measures the speed at which the company makes money. Inventory is the raw materials value tied up in work in process and finished goods. Large amounts of inventory are undesirable because it means that the company has spent money for production that hasn't generated revenue yet. Operating expenses are all of the costs of operations other than direct materials costs. Under the Theory of Constraints, operating expenses are fixed and therefore irrelevant to any TOC decision. Of the three terms, throughput is the most important. It tells the company that it is achieving its goal of making money. Moreover, increases in throughput mean that the rate at which the company is making money is increasing.

So far, we've discussed increasing speed and output and improving quality, but we haven't mentioned any of the conventional management accounting performance measures (i.e., productivity, cost per unit, etc.). TOC won't suggest using any of them, either. Moreover, according to TOC, not only are conventional management accounting performance measures unnecessary, but focusing on them can make things worse.

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1. Introduction

Whether your organization manages stand-alone or multiple projects, whether those projects are small or large, whether your customers are internal or external, or whether the nature of the work performed is product development, construction, design, IT, or service; most projects are difficult to manage because of two things:

1) They involve uncertainty, and
2) They involve three different and opposing commitments: Due date, budget, and content

In organizations that attempt to manage multiple concurrent projects with common, shared resources, the job is even more challenging. Managers can quickly find themselves on "project overload" with continual resource shortages and great difficulty in determining which tasks are truly the most important.

If this is beginning to sound familiar, then you are probably experiencing some of these problems in your organization:

- There are difficulties completing projects on time, within budget and with full content.
- There is too much rework activity.
- Promised lead times are longer than desired.
- Existing project work is not complete before new projects require a shifting in priorities.
- Project Managers and Resource Managers have frequent conflicts about priorities and resource commitments.
- Existing project work is not complete before new projects require a shifting in priorities.
- Problems in one project cascade into problems in other projects.
- Some projects are abandoned or completed without the organization gaining the promised benefit.
- The organization is too slow responding to important opportunities.

This paper provides a brief introduction into the basics of TOC Project Management, showing how the solution addresses the underlying root causes of the problems listed above. It is organized in the context of answering three very important questions:

1. "What To Change?"
2. "To What To Change?"
3. "How To Cause The Change?"

2. Literature Review And Hypotheses

In today's competitive global economic marketplace, manufacturers are struggling to squeeze out 5% to 7% operational cost reductions. The reality is startling. If a plant is not consistently improving performance, it is in danger of closing. However, if a company is able to find a way to increase throughput with the same or less resources, it may mean the difference between continuing operations in North America or moving them to lower cost regions around the world.

Twenty years after Eliyahu Goldratt first introduced the Theory of Constraints in his book The Goal, the manufacturing world is again experiencing another paradigm shift in thinking. Through the synthesis of the Theory of Constraints and lean manufacturing techniques, continuous improvement efforts and ultimately, performance improvement areno longer measured over periods of years, but weeks.

When one looks at the Theory of Constraints, the underlying principle emphasizes the importance of identifying and eliminating bottlenecks (constraints) in the manufacturing process-not only to increase productivity, but as a tool for measuring and controlling the flow of materials. The only problem is how to actually identify these constraints.

However, the fundamental approach to lean manufacturing is to maximize the amount of net good parts per shift by striving for true one-piece flow. Targeting balanced flow, buffers of excess inventory between each point in the process are removed, making it immediately apparent which process is underperforming. With this knowledge, a manager candispatch resources to address the situation, knownas "go and see."

While both ideas are productive, the key to unlocking true value and performance improvement is in merging the two approaches. Maximize your "go and see" efforts by focusing resources on the true constraint; the result is a seamless flow of production that generates the highest possible return. This simple idea in theory wasa nearly impossible task in reality, until now.

By taking a constraint-based approach to maximizingthe flow of product through the plant, you end up with less data, but more critical, decision-enabling information directly from the plant floor. This is accomplished by limiting and prioritizing data collection and identifying the key chronic constraints that must be corrected tomeet a specified throughput target. This allows plant personnel to focus their efforts on corrections that will lead to the greatest improvements in plant performance. The results are astounding.

"Manufacturers need to be able to improve plant performance by eliminating bottlenecks one constraint at a time. By focusing directly on true constraints, manufacturing operations can significantly improve efficiency on the plant floor." -- Greg Gorbach, VP of Collaborative Manufacturing, ARC Advisory Group

Recently, the idea of synthesizing lean and the Theory of Constraints was utilized by a major Tier Oneautomotive supplier with two goals: to provide better clarity and focus by identifying true constraints, and to spend less time collecting data and more time solving problems.

In this project, weekly kaizen events were driven by the application. By measuring the identified constraints before and after focused kaizen events, the true value of the system would soon be revealed.

Almost immediately, constraints that had not been identified after 18 months of lean initiatives on one line were now completely visible. The system proved that resources were being misdirected towarddowntime issues that had no impact on throughput.

As a result, improvement efforts were directed to areas where true constraints existed, resulting in performance improvement and project acceleration. In just seven weeks, throughput increased by 6.6%. Themanufacturer estimated an annual savings in overtime costs of $840,000.

3. Methodology

3.1. Indentifying "What to Change?"

In order to make significant and lasting improvements in the way projects are managed, an organization must effectively address the underlying root causes that lead to the above problems.

The dominant root cause in organizations performing multiple projects with shared resources is the unavoidable conflict about when to begin new project work. In almost every organization, there are continual internal and external pressures to address important new opportunities. At the same time, managers recognize that beginning new work too soon may divert needed resources from ongoing project work, compromising their ability to meet existing commitments. Unfortunately, with imperfect knowledge of the true status of current project work, ongoing pressures to increase the organization's output, and a belief that delaying a project's start will only serve to delay it's finish, managers all too frequently make decisions that overload the organization.

The root cause that dominates the execution of individual projects is a planning and scheduling process thatis based on several erroneous assumptions. One such assumption is the widespread belief that placing protection time in every task will lead to optimized project performance – that good individual task performance will inherently lead to good overall project performance. Couple this with the fact that today's most widely used scheduling algorithms don't provide proper protection for the effects of integrating pathways (many parallel paths of work, all of which must be completed before a common successor task may begin), don't correctly address resource dependencies, and don't properly account for task and iteration variability, and the stage is set for almost certain disaster (See Figure 1). These

algorithms calculate overly optimistic schedules that will almost certainly throw the project into expensive firefighting once it is recognized that the commitment is inserious jeopardy. Rushed up-front planning aggravates this situation by missing out important task and resource dependencies.

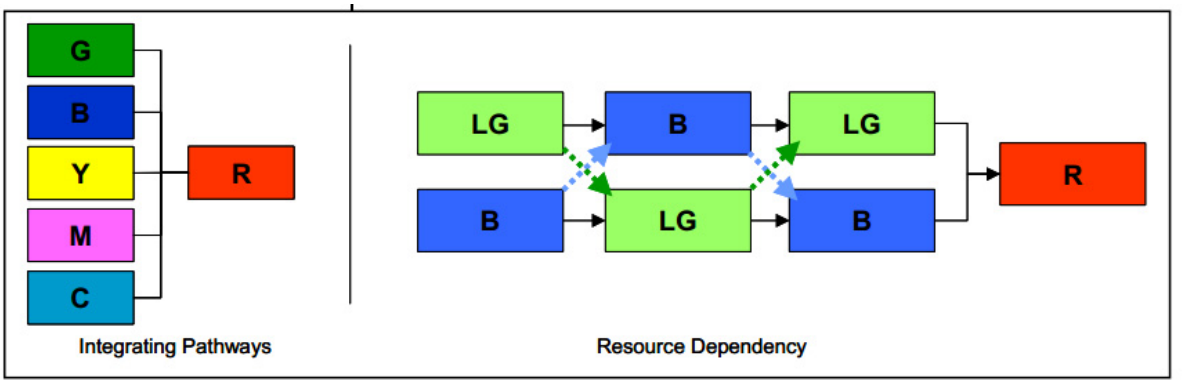

Figure 1. Today's widely used scheduling algorithms don't provide proper protection for the way in which projects are mapped.

Ultimately, firefighting becomes rampant, most people become severely multi-tasked, and management institutes coping mechanisms for more and more tracking of individual task and budget performance - ultimately resulting in more overhead and adding even more "protection time" to task estimates in an attempt to guarantee that people's work will meet management's expectations.

Under such circumstances, people begin to place a higher priority on self-preservation. Being measured on individual task performance, people realize that it is not in their best interest to report early finishes. They may feel it will compromise their future negotiations or they may worry about being blamed for problems in their work because they did not take all the time they were given. More than likely, the task completion criteria are also very vague and people even feel encouraged to work well beyond what is truly good enough. At the same time, since most people carrysuch heavy loads, just the knowledge that the "protection time" is there makes them believe it is possible to use some of that time to finish other, more time-critical work.

The net result is that work that could have been turned in early is not and the project has little chance to take advantage of any "positive variation." The effect of late tasks accumulates day-by-day while any potential for early task completion is almost completely masked. Unless these two major root causes are addressed effectively, there is little chance for any organization to make significant and lasting improvements in project management performance.

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3.2. Indentifying "To What to Change To?"

The TOC Project Management provides a comprehensive solution to address these root causes and coping mechanisms. The solution includes 1) a robust planning process, 2) a more effective scheduling process, 3) a methodology for introducing work that actually leads to increased capacity, 4) execution processes that provide excellent project control, visibility and decision support, and 5) work behaviors that are more conducive to good project performance.

3.3. Indentifying "How to cause the change?"

For many organizations, projects are "what we do for a living." Projects are their business. In such environments, changing how people manage projects is tantamount to changing the basic fabric of the business. Clearly, one must approach such change with great care. The right people must be brought into the picture at the right time, in just the right way. The process must move slowly enough to permit identification of essential changes, yet fast enough that it does not lose the momentum that is necessary to sustain continued progress. Goldratt has developed a very robust

implementation process consisting of six distinct phases. Each phase builds upon the next and each is specifically designed around a logical progression of obtaining the true support and collaboration of the participants.

In the first phase, senior management learns what changes are required and what their roles need to be in facilitating that change. In order for change to succeed, they need to be in consensus that they will continue to champion the change for the long term.

Once they are aligned, management needs to inform the organization about what will change, why the change is necessary, how the organization and each of its people will benefit, and when and how theywill be "brought on board." Following the informational briefing, the hard work begins.

There is a third phase, where previously trained experts begin to use the generic solution to identify areas where customization will be required to address the unique needs of the organization. In order to minimize disruption to the organization, only a few necessary people are brought into the activities of Phase three.

During the fourth phase, the rest of the organization is brought into the picture. People are trained and begin to participate in their designated roles. This is also the phase where the readiness of all support systems is verified.

The fifth phase is more of an event than a phase of significant time duration. It is analogous to "throwing the switch" to take the system "live." This is the point at which TOC Project Management truly becomes the "way we do our work." If everythinghas been done properly up to that point, much of the chaos has now been driven out of the organization, setting up the final stage.

The sixth phase begins the process of ongoing improvement. A this stage, the organization has so much visibility to every aspect of its project management system that people can begin to systematically pinpoint and implement changes that will bring the most improvement to the bottom line.

4. Conclusion

TOC brings a new dimension to management philosophy and provides an interesting challenge to the traditional ways of looking at an organization's profitability. Adopted within a wide variety of organizations and settings, it appears that organizations using TOC have determined that it can help them achieve a number of management objectives, including continuous improvement. Using TOC, like any other form of information, should be guided by the purpose or requirements it is necessary to meet. In the end, the goal of every organization is the same; optimize profitability by meeting customer requirements better than the competition. It is this purpose the information system needs to serve.

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